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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/605,891	11/04/2003	Howard S. Landis	BUR920030033US2	2890
29625	7590	06/10/2005	EXAMINER	
MCGUIRE WOODS LLP 1750 TYSONS BLVD. SUITE 1800 MCLEAN, VA 22102-4215			NGUYEN, JOSEPH H	
			ART UNIT	PAPER NUMBER
			2815	

DATE MAILED: 06/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/605,891

Applicant(s)

LANDIS, HOWARD S.

Examiner

Joseph Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) 18-29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17, 30 and 31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 April 2004 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date: _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 10-12 and 31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 10, it is not understood the phrase "a minimum spacing between the dummy fill shapes are one to four times a maximum spacing for the first non rigid dielectric wiring level" since what the so-called maximum spacing for the first non rigid dielectric wiring level refers to is not clearly defined.

Regarding claim 11, it is not understood the phrase "a minimum spacing between the dummy fill shapes are equal to a minimum spacing width for the first non rigid dielectric level" since what the so-called minimum spacing width for the non rigid dielectric level refers to is not clearly defined.

Regarding claims 12 and 31, it is not understood the phrase "a density of the dummy fill shapes is between approximately 45% to 50%" since in what respect the density of 45% to 50% is measured with is not clearly defined.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 30 is rejected under 35 U.S.C. 102(b) as being anticipated by Yang et al.

Regarding claim 30, Yang et al. discloses on figure 7 a process of forming a semiconductor structure, comprising forming a first rigid dielectric layer 17 (col. 4, lines 15-16); forming a first non rigid dielectric wiring level 18 (col. 4, line 7) on the first rigid dielectric layer having an interconnect 36 (col. 5, lines 35-37); forming a second rigid dielectric layer 23 (col. 4, lines 56-57); on the first non rigid dielectric wiring level; and forming a plurality of dummy metal fill shapes 30, 34 (col. 5, lines 35-37) in the first non rigid dielectric wiring level in proximity to the interconnect for preventing a portion of the first or second rigid dielectric layers adjacent the interconnect from de-layering away from the interconnect.

Yang et al. teaches the use of the dummy fill shapes 30, 34 formed in the first non-rigid wiring level 18 increases the mechanical strength of the via layer to increase its resistance to delamination and scratching (col. 6, lines 40-45). Therefore, a plurality of dummy metal fill shapes formed in the first non rigid dielectric wiring level in proximity to the interconnect are used to prevent a portion of the first or second rigid dielectric layers adjacent the interconnect from de-layering away from the interconnect.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-9, 13-14, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang et al. in view of Yu et al.

Regarding claim 1, Yang et al. discloses on figure 7 substantially all the structure set forth in the claimed invention (see rejection of claim 30 above) except a low k dielectric layer having dummy fill shapes arranged above the second rigid dielectric layer. However, Yu et al. discloses on figure 5b a low k dielectric layer 26 (col. 3, line 29) having dummy fill shapes arranged above the second rigid dielectric layer (col. 4, lines 49-54). In view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Yang et al. by having a low k dielectric layer having dummy fill shapes arranged above the second rigid dielectric layer for the purpose of increasing the mechanical strength in a semiconductor device (col. 2, lines 23-24).

Regarding claim 2, Yang et al. discloses on figure 7 the structural securing means comprises at least one dummy fill shape 34 (col. 5, lines 36-38) in proximity to the interconnect 36. The dummy fill shape is formed of copper, which inherently has a coefficient of thermal expansion better matched to the first and second rigid dielectric

layers 17, 23 (formed of silicon nitride, col. 4, lines 14-15) than that of the first non rigid dielectric wiring level 18 (formed of benzocyclobutene, col. 3, line 67).

Regarding claim 3, Yang et al. discloses the at least one dummy fill shape 34 is one of alloy predominately composed of copper (col. 5, lines 36-38).

Regarding claim 4, it is inherent that the effective CTE of a region of the first non rigid dielectric wiring level 18 is reduced in proportion to a density of the at least dummy fill shape (col. 5, lines 28-30, Yang et al.).

Regarding claim 5, Yang et al. discloses on figure 7 the structural securing means are plurality of dummy fill shapes 30, 34 aligned in rows and columns about the interconnect 36.

Regarding claim 6, Yu et al. teaches in col. 2, lines 55-67 the dummy fill shapes (the structural securing means) can be used to reduce thermal stress delamination, which eventually leads to the structural securing means having an overall local metal density such that CTE mismatch stresses and deflection substantially toward zero.

Regarding claim 7, Yu et al. teaches in col. 2, lines 55-56 the structural securing means reduces temperature driven stress.

Regarding claim 8, Yang et al discloses the structural securing means inhibits deflecting of the first and second rigid dielectric layers (col. 6, lines 40-45).

Regarding claim 9, Yang et al. discloses on figure 7 the structural securing means are dummy fill shapes 30, 34 adjacent to the interconnect 36; the dummy fill shapes are one of an alloy composed of copper; and the dummy fill shapes are electrically isolated

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from each other and the interconnect. Note that it is well known to use the interconnect having a line width greater than 1 micron, which is a large, broad range.

Regarding claim 13, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify Yang et al. and Yu et al. by having a width and length of the dummy fill shapes being 3X a minimum line width of the interconnect, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 14, Yang et al. discloses on figure 7 the structural securing means are dummy fill shapes 30, 34 in staggered offset pattern surrounding the interconnect 36.

Regarding claim 17, Yang et al. discloses on figure 7 the structural securing means are a plurality of square shaped dummy fill shapes arranged in a staggered pattern in the first non-rigid dielectric wiring level.

Claims 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang et al. and Yu et al., and further in view of Zhou et al.

Regarding claim 15, Yang et al. and Yu et al. discloses substantially all the structure set forth in the claimed invention except the first non rigid dielectric wiring level being a low k dielectric siloxane based semi organic layer. Note that Yang et al. discloses the low k dielectric material is hydrogen silsesquioxane (col. 4, line 3). However, Zhou et al. discloses hydrogen silsesquioxane or siloxane based can be

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alternatively used (col. 5, lines 3-12). In view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Yang et al. and Yu et al. by having the first non rigid dielectric wiring level being a low k dielectric siloxane based semi organic layer because they are recognized in the art as equivalents.

Regarding claim 16, Yang et al. and Yu et al. discloses substantially all the structure set forth in the claimed invention except the first and second rigid dielectric layer containing silicon oxide based. Note that Yang et al. discloses the first and second rigid dielectric layer containing silicon nitride (col. 4, lines 14-15). However, Zhou et al. discloses silicon nitride and silicon oxide can be alternatively used (col. 3, lines 56-57). In view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Yang et al. and Yu et al. by having the first and second rigid dielectric layer containing silicon oxide based because they are recognized in the art as equivalents.

Response to Arguments

Applicant's arguments with respect to claims 1-17, 30-31 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Nguyen whose telephone number is (571) 272-


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1734. The examiner can normally be reached on Monday-Friday, 7:30 am- 4:30 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306 for regular communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JN

June 3, 2004


GEORGE ECKERT
PRIMARY EXAMINER